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HEAT RECLAMATION FROM FLIGHT SIMULATORS.(U)  
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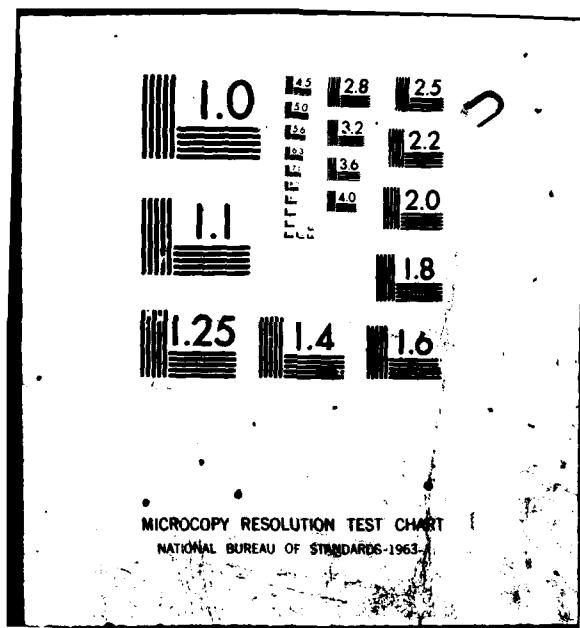
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HEAT RECLAMATION FROM  
FLIGHT SIMULATORS

FINAL REPORT



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REPORT FESA-TS

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HEAT RECLAMATION FROM FLIGHT SIMULATORS

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P. B. / SHEPHERD  
~~JOHNS MANVILLE SALES CORPORATION~~  
RESEARCH & DEVELOPMENT CENTER  
KEN-CARYL RANCH, DENVER, COLORADO 80217

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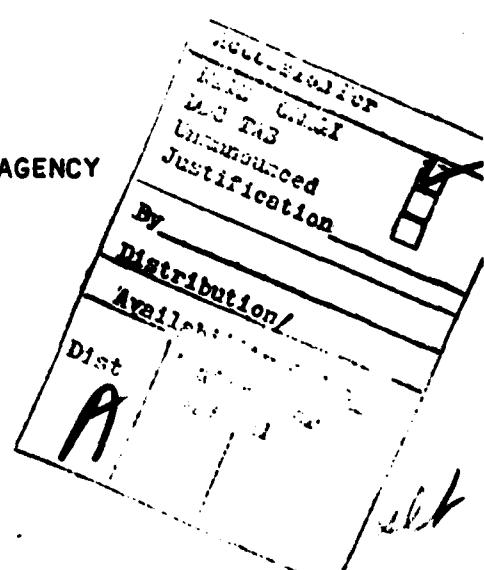
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PREPARED FOR:

U. S. ARMY FACILITIES ENGINEERING SUPPORT AGENCY  
TECHNOLOGY SUPPORT DIVISION  
FORT BELVOIR, VIRGINIA 22060



## SUMMARY

 This report consists of Summary only.

The objective of Task Order No. 9 was to conduct a market and literature survey to determine the current state-of-the-art on heat reclamation devices for air conditioners used with flight simulators. Applicability of such devices to each flight simulator facility will be evaluated and will include energy savings, cost effectiveness, operation, maintenance, safety, code compliance and product warranty limitation considerations.

The U. S. Army operates helicopter flight training simulators at the following facilities:

Fort Sill, Oklahoma  
Fort Riley, Kansas  
Fort Hood, Texas  
Fort Rucker, Alabama  
Fort Ord, California  
Fort Bragg, North Carolina  
Fort Campbell, Kentucky  
Fort Carson, Colorado

A flight training building is being constructed at Fort Stewart, Georgia. All but one of the flight training facilities are instrument flight trainers. The facilities at Fort Rucker, Alabama, consist of both instrument and visual flight simulators. One building houses the instrument units and a second building houses the visual training units. Energy use at some flight training facilities was viewed as being very high (26,000 kwh per day) and the air conditioning requirements were consequently suspected of being extreme.

An inspection was made of the Fort Rucker facilities and a telephone survey was made of the remaining facilities. A table summarizing the surveys is appended to this Summary. In addition, the flight training facilities of United Airlines were inspected with a consultant, Dr. E. D. Sloan of the Colorado

School of Mines, who co-authored the Task Order No. 2 report on heat recovery devices for air conditioners.

It was concluded that there is little potential for heat recovery at nearly all of the facilities because the refrigerant used (R-22) and operating characteristics of the chillers produce compressor discharge temperatures ranging from 90°F to 120°F. This low temperature range is potentially suitable only for chilled air reheat if required for humidity control. Only Fort Riley and Fort Rucker, Building 5102, indicated a requirement for air reheat to control humidity. All facilities excepting Fort Rucker had relatively small chillers ranging from a 7-1/2 ton unit at Fort Campbell to 60 tons at Fort Riley. Fort Rucker had two units of 160 tons and two of 180 tons. Air conditioning loads did not seem to be unusually high for flight training facilities with the special air requirements of their computer facilities.

Building 5102 at Fort Rucker did have a seemingly high consumption of electricity of 26,600 kwh per day. This, however, was the only visual flight training facility and 14,400 kwh per day was the rating of large lamp arrays required to illuminate visual terrain boards. Conversion of the cockpit imaging sources to a tabletop computer system such as Redifon's Nova Vue would eliminate the 14,400 kw lighting requirement as well as possibly reducing air cooling and humidity control requirements.

Building 5102, the visual flight training facility, also contained three cockpit chillers. These were rather conventional window air conditioning units used to maintain comfort level within the training cockpit of flight simulators. Each 3 ton unit was a York PF 24-60 with a reciprocating compressor. The three cockpit chillers might be used to provide tepid water for lavatory use. However, hours per day operation of the units is unknown because the building had not been placed in full use. Also, York does not offer heat recovery retrofit units for their air conditioners.

It is recommended that each facility requiring chilled air reheat for humidity control consult the

local service office of the chiller manufacturer for a survey. For example, the Trane Company who manufactured the Fort Rucker chillers sells retrofit heat exchangers for heat reclamation to be used for air reheat. They indicated a willingness to provide a survey of the facility and recommend a course of action based on current technology.

TABLE 1  
SUMMARY OF FLIGHT SIMULATOR BUILDING COOLING SURVEY

Facility	No. of Buildings	Chiller/Air Conditioner				Capacity Refrig- erant Btuig	Discharge Pressure Btuig	Discharge Temp °F
		No. of Instrument Units	No. of Visual Units	Make	Model			
Port Rucker	2	Mary	Mary	Trane	ICCI744(2)	180/113	-9	97
				Trane	LOC	160/?	Not Running	97
Port Campbell	1	6 or 8	-	Trane	?	15T/22	(1)	(1)
					?	7½T/22	(1)	(1)
Port Hood	1	4	-	Carrier	3064055610	55T/22	190	90
Port Carson	1	1	-	Trane	03158	12½T/12	120-260	126-158
Port Bragg	1	4	-	York	1CB85546A	-/22	250 Peak	117 Max.
Port Sill	1	4	0		CA2C050 CA2C520	35T/22 10T/22	200 200	102 102
Port Riley	1	?	0	Chrysler	8W60-1	60T/22	225	Reported as 145°F-150°F but R-22 at 225 psig is 110°F
Port Stewart				Adpac	CVMC-12	10T/22	225	No Communication
Port Ord								

(1) Data not available for these units, but R-22 is a rather low temperature refrigerant with, for example, a temperature at only 83°F at a discharge pressure of 150 psig.

